

Econ272a: Topics in IO

Lecture 2: Factor demand models: buyer power

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Readings

- ▶ *Morlacco, M. (2019). Market power in input markets: Theory and evidence from French manufacturing. Unpublished, March, 20, 2019.
- ▶ Rubens, M. (2021). Market Structure, Oligopsony Power, and Productivity. Oligopsony Power, and Productivity
- ▶ Hershbein, B., Macaluso, C., & Yeh, C. (2018). Concentration in US local labor markets: evidence from vacancy and employment data (p. 31). Working paper.
- ▶ Prager, E., & Schmitt, M. (2021). Employer consolidation and wages: Evidence from hospitals. American Economic Review, 111(2), 397-427.

Monopsony/oligopsony power

- ▶ (Empirical) IO has traditionally assumed exogenous input prices.
- ▶ Contrast with labor economics literature
- ▶ Powerful firms may set prices both upstream and downstream
- ▶ Recently, upshoot in research on monopsony/oligopsony power
- ▶ IO has many tools useful to study such market power

Is monopsony/oligopsony important?

- ▶ Need to think about sources of oligopsony vs oligopoly power
- ▶ How concentrated are input markets compared to goods/services markets?
- ▶ How high are switching costs of suppliers/workers compared to consumers?
- ▶ How differentiated are firms from suppliers' and consumers' point of view?
- ▶ How important are search costs for suppliers/workers compared to consumers?

Agenda

- ▶ Motivating reduced-form evidence
- ▶ **Demand-side** models of factor market power
 - ▶ Identification of the production function with endogenous input prices
 - ▶ Identification of markdowns with substitutable inputs
 - ▶ Identification of markdowns with non-substitutable inputs
- ▶ Markdowns and technological change
- ▶ **Supply-side** models of factor market power → next week

Reduced form evidence

- ▶ Prager, E., & Schmitt, M. (2021). Employer consolidation and wages: Evidence from hospitals. *American Economic Review*, 111(2), 397-427.
- ▶ Diff-in-diff setup to compare wage growth between merged and unmerged hospitals, 2010-2020
- ▶ 3 types of labor: unskilled (e.g. cafeteria), skilled medical (e.g. RN), skilled generic (e.g. accountant).

Table 3: Difference-in-Differences Estimates

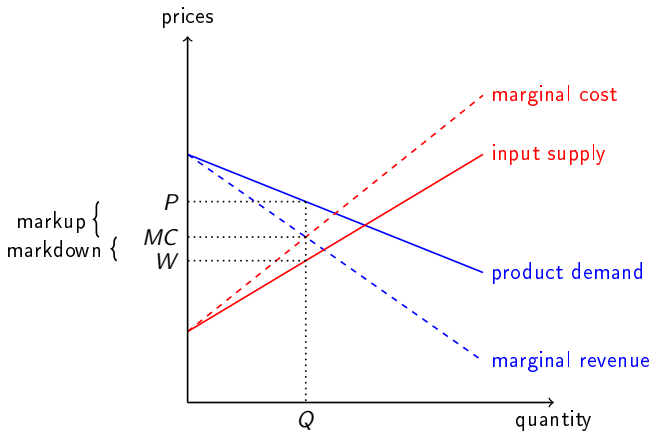
	(1)	(2)	(3)
	Unskilled	Skilled	Nursing & Pharmacy
Post	0.005 (0.005)	-0.006 (0.008)	-0.007 (0.006)
Observations	17,458	17,453	17,328
R-squared	0.913	0.852	0.875
	(4)	(5)	(6)
	Unskilled	Skilled	Nursing & Pharmacy
Post \times 1st quartile Δ HHI	0.004 (0.006)	0.005 (0.010)	0.002 (0.009)
Post \times 2nd quartile Δ HHI	0.007 (0.009)	-0.022 (0.016)	-0.001 (0.010)
Post \times 3rd quartile Δ HHI	0.007 (0.008)	0.002 (0.021)	-0.019 (0.014)
Post \times 4th quartile Δ HHI	0.002 (0.014)	-0.041** (0.019)	-0.070*** (0.022)
Observations	17,458	17,453	17,328
R-squared	0.913	0.853	0.875
H_0 : no heterogeneity	0.978	0.105	0.016**

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. All specifications include hospital and year fixed effects, plus the controls (log) one-bedroom rent, (log) population, (log) beds, (log) case mix index, % Medicare, % Medicaid, % outpatient charges, (log) per capita income, % unemployment, and % of the population age 65 or older. Standard errors are clustered by hospital and observations are weighted by total inpatient discharges. The bottom row reports the p-value of a test of the null hypothesis that the post- Δ HHI quartile effects are equal to one another.

Reduced form evidence: discussion

- ▶ Does markdown change or does MRPL change?
- ▶ Nurses are an input *and* the product
- ▶ Is wage/price change a good welfare measure? See discussion in Nocke and Whinston (2020) Concentration screens for horizontal mergers
- ▶ Total employment change should probably be key metric for welfare loss
- ▶ Amenities could change too

Identification of monopsony/oligopsony power



Identification of monopsony/oligopsony

- ▶ Profits might be due to either oligopoly or oligopsony power
- ▶ Marginal costs are usually unobserved, P and W are
- ▶ So need a model to distinguish markdowns from markups*
- ▶ Usually, either model demand (cost) side or supply side. We will cover both approaches

Endogenous input prices

- ▶ Let input prices be endogenous
- ▶ Input supply curve upward-sloping to the individual firm (oligopsony power)

$$\psi_{ft}^l \equiv \frac{\partial W_{ft}^l}{L_{ft}} \frac{L_{ft}}{W_{ft}^l} + 1 \geq 1$$

- ▶ $\psi_{ft}^l - 1$ is inverse input supply elasticity
- ▶ If $\psi_{ft}^l = 1$, input price is exogenous to firm
- ▶ the higher ψ^l , the more input market power a firm has
- ▶ One can prove that $\psi_{ft}^l = \frac{MRPL_{ft}}{W_{ft}^l}$, with $MRPL_{ft} = \frac{\partial(P_{ft}Q_{ft})}{\partial L_{ft}}$ (try this at home: same FOCs as previous classes)
- ▶ So 'markdown' of input price below marginal revenue product is equal to the inverse input supply elasticity.

Monopsony/oligopsony power in U.S.A.?

- ▶ Dismal wage growth in U.S.A. could be due to labor market power by firms..
- ▶ ... but could also be due to other reasons, such as non-neutral technological change, market power downstream, etc.
- ▶ Classical monopsony model generates unemployment, which has declined, and is historically low in U.S.A.
- ▶ Declining unionization rates: bilateral oligopoly towards unilateral oligopsony?
- ▶ Need model to distinguish oligopsony power from oligopoly power from productivity/technical change.

Markups vs. markdowns

- ▶ Using cost minimization, can obtain the following markup expression:

$$\mu_{ft} = \frac{\beta_{ft}^l}{\frac{W_{ft}^l L_{ft}}{P_{ft} Q_{ft}} \psi_{ft}^l}$$

- ▶ Same derivation using labor FOC as last time (proof is in De Loecker et al. (2016) appendix).
- ▶ The markup we estimated last time is a *joint* margin containing both the markup (P/marginal cost) and the markdown (marginal cost/W).
- ▶ This leaves us two questions: (i) can we still identify the production function, and (ii) can we separately identify the markup and the markdown?

Identification: production function

- ▶ Control function approaches: ψ_{ft} affects input demand
- ▶ So no TFP inversion of first stage of ACF(2015), OP(1996), etc...
- ▶ Same issue as with markup estimation
- ▶ Solution 1: Impose model of competition upstream in which heterogeneity in ψ_{ft} gets absorbed by input prices and input market shares.
 - ▶ Add these in the first stage regression of ACF(2015)
 - ▶ Need to be precise on input/output market definitions
 - ▶ Need to observe input prices
- ▶ Solution 2: use method that does not rely on inverting ω (e.g. dynamic panel approach)

Identification: markdowns

- ▶ With a single input, μ_{ft} and ψ_{ft} clearly not separately identified.
- ▶ With $N > 2$ substitutable inputs:
- ▶ Morlacco (2019): suppose two variable inputs L,M and a fixed input K
- ▶ E.g. Cobb-Douglas in L, M, and K:

$$q_{ft} = \beta^l l_{ft} + \beta^m m_{ft} + \beta^k k_{ft} + \omega_{ft}$$

- ▶ Or, any function that is twice differentiable in all inputs

Identification: markdowns

- FOCs for the variable inputs:

$$\begin{cases} \mu_{ft} = \frac{\beta_{ft}^l}{\frac{W_{ft}^l L_{ft}}{P_{ft} Q_{ft}} \psi_{ft}^l} \\ \mu_{ft} = \frac{\beta_{ft}^m}{\frac{W_{ft}^m M_{ft}}{P_{ft} Q_{ft}} \psi_{ft}^m} \end{cases}$$

- Need that one of both input price is exogenous, e.g. $\psi_{ft}^m = 1$
- Then input price markdown of the other is identified:

$$\psi_{ft}^l = \frac{\beta_{ft}^l}{\beta_{ft}^m} \frac{\frac{W_{ft}^m M_{ft}}{P_{ft} Q_{ft}}}{\frac{W_{ft}^l L_{ft}}{P_{ft} Q_{ft}}}$$

Morlacco (2019)

- ▶ French data, 1996-2007
- ▶ Firms assumed to be price-takers on domestic intermediate input markets, but price-setters on international input markets.
Competitive labor market
- ▶ Estimates markdown wedge over internationally-sources intermediate inputs
- ▶ Quantifies resulting deadweight loss

TABLE V. (RELATIVE) INPUT MARKET POWER, BY SECTOR

SECTOR	ψ^x_I/ψ^m_I	$\tilde{\psi}^x_I$	REGIME
15 Food and Beverages	1.72	1.66	MO
17 Textiles	1.03	1.19	MO
18 Wearing Apparel	1.15	1.2	MO
19 Leather Products	1.13	1.25	MO
20 Products of Wood	1.46	1.47	MO
21 Pulp and Paper Products	0.95	.956	EB/QD
22 Printing and Publishing	1.49	1.64	MO
24 Chemical Products	1.18	1.17	MO
25 Rubber Products	1.25	1.19	MO
26 Non-metallic minerals	1.27	1.33	MO
27 Basic Metals	1.62	1.5	MO
28 Fabricated Metal Products	1.38	1.38	MO
29 Machinery and Equipment	1.68	1.43	MO
31 Electrical Machinery	1.40	1.23	MO
32 Radio and Communication	1.65	1.43	MO
33 Medical Instruments	1.66	1.45	MO
34 Motor Vehicles, Trailers	1.66	1.26	MO
35 Other Equipment	2.13	1.64	MO
Average	1.43	1.35	MO

Hershbein, Macaluso, Yeh (2022)

- ▶ US Census data
- ▶ Same approach as Morlacco, but assume firms are price-takers on intermediate input markets, price-setters on labor markets
- ▶ Find increasing markdowns

Motivating evidence

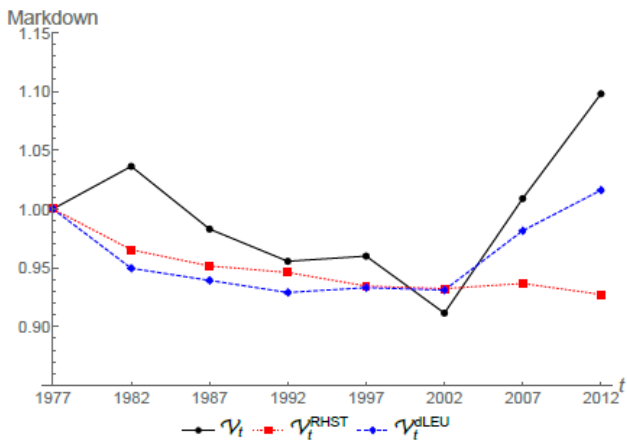
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Identification - substitutable inputs

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Identification - non-substitutable inputs

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Identification: markdowns - discussion

- ▶ Need to pick competitive factor market. What if all are imperfectly competitive? How to test for exogenous input price assumption?
- ▶ What if adjustment costs on labor?
- ▶ Non-neutral technical change

$$\psi_{ft}^l = \frac{\beta_{ft}^l}{\beta_{ft}^m} \frac{\frac{W_{ft}^m M_{ft}}{P_{ft} Q_{ft}}}{\frac{W_{ft}^l I_{ft}}{P_{ft} Q_{ft}}}$$

- ▶ What if inputs are not substitutable?

Identification of markdowns: non-substitutable inputs

- ▶ Suppose we have non-substitutable input M

$$Q_{ft} = \min\{L_{ft}^{\beta^l} K_{ft}^{\beta^k} \Omega_{ft}; \beta^m M_{ft}\}$$

- ▶ Markup with endogenous input prices is (Rubens, 2020):

$$\mu_{ft} = \frac{1}{\frac{\psi_{ft}^l \alpha_{ft}^l}{\beta^l} + \psi_{ft}^m \alpha_{ft}^m}$$

- ▶ Can we still identify markup from markdowns?
 - ▶ If substitutable input has endogenous price and non-substitutable input exogenous price: yes, as long as there is one substitutable input with exogenous price. E.g. $\mathbf{L} = (L_1, L_2)$ with W_1^L endogenous but W_2^L exogenous
 - ▶ If non-substitutable input has endogenous price ($\psi^m > 0$): no
 - ▶ Reason: insufficient degrees of freedom in input demand problem: cannot change \mathbf{L} while keeping \mathbf{M} constant.

Rubens (2020)

- ▶ Estimate markdown and markup with non-substitutable input
- ▶ Requires combining factor demand and supply model (cfr next week)
- ▶ Examines how markdowns and markups change with ownership consolidation of Chinese SOEs
- ▶ Correct input substitution pattern is crucial for inference on (i) markdown levels and changes, and (ii) productivity effects of mergers

Conclusions

- ▶ Markdown estimation from production side: no assumptions on firm conduct, market definition, etc.
- ▶ Hinges on Hicks-neutrality
- ▶ In practice, limited number of occupational categories: power to distinguish output elasticities of different labor types
- ▶ No switching costs (but could be accommodated)
- ▶ **Combining** production/demand model with supply model could be a way forward. See L4.